

Table 11.1 - Emissions from Electricity Generators

(Thousand short tons of gas)

	<u>1990</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>
Coal Fired					
Carbon Dioxide	1,727,301	2,021,154	2,039,106	2,359,560	2,558,783
Sulfur Dioxide	15,711	12,158	NA	NA	NA
Nitrogen Oxide	6,881	6,934	NA	NA	NA
Petroleum Fired					
Carbon Dioxide	119,411	125,207	80,417	17,376	19,633
Sulfur Dioxide	842	942	NA	NA	NA
Nitrogen Oxide	204	167	NA	NA	NA
Gas Fired					
Carbon Dioxide	316,583	340,999	246,907	406,528	610,600
Sulfur Dioxide	2	2	NA	NA	NA
Nitrogen Oxide	918	676	NA	NA	NA
Other ¹					
Carbon Dioxide	155,641	15,367	NA	NA	NA
Sulfur Dioxide	235	104	NA	NA	NA
Nitrogen Oxide	122	95	NA	NA	NA
Total					
Carbon Dioxide	2,318,936	2,502,728	2,366,430	2,783,464	3,189,016
Sulfur Dioxide	16,790	12,450	11,050	9,700	8,950
Nitrogen Oxide	8,125	5,710	4,280	4,040	4,180
Methane	25	29	NA	NA	NA
Nitrous Oxide	27	31	NA	NA	NA
Sulfur Hexafluoride ²	1.5	0.7	NA	NA	NA

Sources: EIA, *Annual Energy Outlook 2002*, DOE/EIA-0383(2002) (Washington, D.C., December 2001), Tables A8 and A19, EIA, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Table 12.6, EPA, 2001 National Emissions Tables, Tables 2-15, 2-16, <http://www.epa.gov/globalwarming/publications/emissions/us2001/tables.html>, EPA, U.S. High GWP Emissions 1990-2010: Inventories Projections and Opportunities for Reductions EPA-ooo-F-97-000, (June 2001), Tables 3.2 and 3.3, http://www.epa.gov/globalwarming/publications/emissions/highgwp_emit.pdf.

Notes:

¹ Plants fired by light oil, methane, coal-oil mixture, propane gas, blast furnace gas, wood and refuse

² Sulfur hexafluoride (SF6) is a colorless, odorless, non-toxic, and non-flammable gas used as an insulator in electric T&D equipment. SF6 has a 100-year global warming potential that is 23,900 times that of carbon dioxide and has an atmospheric lifetime of 3,200 years.

Table 11.2 - Installed Nameplate Capacity of Utility Steam-Electric Generators With Environmental Equipment

(Megawatts)

	<u>1990</u>	<u>1999</u>
Coal Fired		
Particulate Collectors	315,681	324,109
Cooling Towers	134,199	146,377
Scrubbers	69,057	89,666
Total ¹	317,522	331,379
Petroleum and Gas Fired		
Particulate Collectors	33,639	29,371
Cooling Towers	28,359	29,142
Scrubbers	65	0
Total ¹	59,372	55,812
Total		
Particulate Collectors	349,319	353,480
Cooling Towers	162,557	175,520
Scrubbers	69,122	89,666
Total ¹	376,894	387,192

Source: EIA, *Annual Energy Review 2000*, DOE/EIA-0384(2000) (Washington, D.C., August 2001), Table 12.7.

Notes:

¹Components are not additive because some generators are included in more than one category.

1999 data are preliminary.

Data cover only plants with fossil-fuel steam-electric capacity >100 MW.

Table 11.3 - EPA-Forecasted Nitrogen Oxide, Sulfur Dioxide and Mercury Emissions from Electric Generators

	<u>2000</u>	<u>2005</u>	<u>2010</u>
NO _x (Thousand Tons)			
Base Case ¹	6,066	6,487	6,272
Worse Case ²	6,407	6,891	7,176
Better Case ³	5,993	6,108	6,052
SO ₂ (Thousand Tons)			
Base Case ¹	10,716	10,880	9,408
Worse Case ²	10,257	10,647	9,763
Better Case ³	11,037	10,807	9,323
Mercury (Tons)			
Base Case ¹	60.0	64.5	60.7
Worse Case ²	63.3	66.9	68.1
Better Case ³	58.9	60.3	59.3

Source: Environmental Protection Agency (EPA), EPA's Forecast of Electric Power Generation and Air Emissions, Tables 4, 8, and 11, <http://www.epa.gov/capi/capi/frcsttbl.html#goto8>.

Notes:

¹ Base Case is the NERC forecast adjusted for the Climate Change Action Plan, with 15-20% reserve margins, 75% transmission transfer capacity, 65 year limit of >50 MW coal plants, minor reduction in nuclear capacity to 90 GW, fossil plant availability increases to 85%, combined cycle heat rates reduce to 5,687 Btu/kWh, nonhydro renewables based on AEO96.

² Worse Case is similar to the Base Case with the following key difference: 25% reduced demand, 13-18% reserve margins, 80% transmission transfer capacity, 80 year limit on >50 MW coal plants, greater reduction in nuclear capacity to 84 GW, fossil plant availability increases to 90%, combined cycle heat rates reduce to 6752 Btu/kWh.

³ Better Case is similar to Base Case, but adjusts for Climate Change with a greater reduction in demand, 70% reserve margins, 60 year limit on >50 MW coal plants, and non-hydro renewables with 40% cost reduction by 2005.

Table 11.4 - Market Price Indices for Emissions Trading in the South Coast Air-Quality Management District

	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2005</u>	<u>2010</u>
Market Price Indices ¹								
RECLAIM Trading Credit (\$/lb) ²								
Nitrogen Oxide	0.05	0.08	0.20	0.90	42.69	11.11	6.95	6.58
Sulfur Dioxide	0.15	0.08	0.34	0.29	1.14	6.82	4.73	4.73
Emission Reduction Credit (\$/lb/day) ³								
Nitrogen Oxide	2,070	2,908	4,515	4,560	7,675	16,809	NA	NA
Sulfur Dioxide	1,367	1,740	1,687	1,687	3,721	7,184	NA	NA
Particulate Matter (<10 microns)	2,418	1,947	1,981	3,175	6,942	19,030	NA	NA
Reactive Organic Gas	1,075	754	744	735	1,904	1,869	NA	NA
Carbon Dioxide	NA	NA	NA	NA	1,000	7,259	NA	NA

Source: Cantor Fitzgerald EBS, SCAQMD RTC/ERC MPI History, <http://www.emissionstrading.com>.

Notes:

¹ Market Price Indices (MPIs) reflect current market conditions for a particular date. Dates used here are end of year: 11/12/96, 12/29/97, 12/21/98, 12/27/99, 12/28/00, and 12/7/01. Prices are an average of the most recent price, lowest bid, and highest bid for RTC and ERC transactions executed by Cantor Fitzgerald and/or reported by the South Coast Air Quality Management District (SCAQMD) for 2,000 pounds or more of RTCs or 10 lbs/day or more of ERCs. SCAQMD was chosen because it is the region with the greatest number of emissions traded.

² In the RECLAIM program, the RECLAIM Trading Credit (RTC) is a limited authorization to emit a RECLAIM pollutant in accordance with the restrictions and requirements of the RECLAIM rules. Each RTC has a denomination of one pound of RECLAIM pollutant and a term of one year, and can be held as part of a facility's Allocation or alternatively may be evidenced by an RTC Certificate.

³ Emissions Reduction Credits (ERCs) are reductions in emissions that have been recognized by the relevant local or state government air agency as being real, permanent, surplus, and enforceable. ERCs are usually measured as a weight over time (e.g., pounds per day or tons per year). Such rate-based ERCs can be used to satisfy emission offset requirements of new major sources and new major modifications of existing major sources.

Table 11.5 - Origin of 2000 Allowable SO₂ Emissions Levels

Type of Allowance Allocation	Number of Allowances	Explanation of Allowance Allocation Type
Initial Allocation ¹	9,166,614	Initial Allocation is the number of allowances granted to units based on the product of their historic utilization and emissions rates (performance standards) specified in the Clean Air Act and other provisions of the Act.
Early Reduction Credits	416,989	Early Reduction Credit allowances were given to eligible Phase II units for voluntary emissions reductions made between January 1, 1995 and January 1, 2000.
Allowances for Substitution Units	10,636	A lawsuit settlement allowed for a small amount of allowances to be allocated for Substitution Units in 2000 instead of an earlier year during Phase I.
Allowance Auctions	250,000	Allowance Auctions provide allowances to the market that were set aside in a Special Allowance Reserve when the initial allowance allocation was made.
Opt-in Allowances	97,824	Opt-in Allowances are provided to units entering the program voluntarily. There were 11 opt-in units in 2000.
Small Diesel Allowances	24,468	Small Diesel Allowances were allocated annually to small diesel refineries that produced and desulfurized diesel fuel during the previous year. These allowances were earned in 1999, which was the last year of the small diesel program
Total 2000 Allocation	9,966,531	
Banked Allowances	11,607,955	Banked Allowances are those held over from 1995 through 1999, which can be used for compliance in 2000 or any future year.
Conservation and Renewable Energy Allowances	9,054	These allowances come from a special reserve set aside when the initial allowance allocation was made. They are awarded to utilities that undertake efficiency and renewable energy measures. These are year 1999 allowances that were allocated in year 2000.
Total 2000 Allowable	21,583,540	

Source: EPA, *Acid Rain Program: Annual Progress Report 2000*, Document EPA-430-R-01-008, Exhibit 5.

Note:

¹ The total year 2000 initial allocation was 9,191,897. A total of 25,283 allowances were surrendered by units that exceeded their 1999 Phase I Extension projected emissions limit, and were subject to Phase I substitution unit provisions.